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SOLAR/1025-79/01

Monthly Performance Report

HELIO THERMICS, INC. - LOT 6

JANUARY 1979

FEB 14 1980

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

HELIO-THERMICS, INC.
HOUSE LOT 6

JANUARY 1979

I. SYSTEM DESCRIPTION

The Helio-Thermics Inc., House Lot 6 is one of two instrumented single-family residences in Greenville, South Carolina. The home has approximately 1086 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system utilizes the attic space as the solar energy collector. The attic roof faces 10 degrees west of south and is pitched at an angle of 51 degrees from the horizontal. Solar energy enters the attic through a 416-square-foot aperture which is double-glazed with corrugated, translucent, fiberglass-reinforced, acrylic panels. The interior of the attic is painted black to maximize the absorption of solar energy. Warm air accumulates in the peak of the attic roof and circulates through the conditioned space or through storage by an air handler. Solar energy is stored in an 870-cubic-foot storage bin containing 85,460 pounds of crushed rock. The bin is located under the house and is insulated with 2-inch polystyrene insulation. Cold water is preheated in the attic by thermosiphoning water from the 80-gallon preheat tank through a manifold system of copper tubes. These tubes are attached to black sheet-metal plates, thus enhancing absorption of solar radiation for preheating the water as it circulates to and from the preheat tank. Preheated city water is stored in the preheat tank and supplied, on demand, to a conventional 80-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a water-to-air heat exchanger in the hot air supply-duct provides auxiliary energy for space heating. A gas-fired water heater provides auxiliary energy for the water-to-air heat exchanger and DHW. The system, shown schematically in Figure 1, has seven modes of operation.

Mode 1 - Collector-to-Storage: This mode activates when there is no demand for space heating and the collector supply-duct temperature is 26°F higher than the storage temperature. This mode terminates when the temperature difference between the collector and storage is less than 16°F.

Mode 2 - Storage-to-Space Heating: This mode activates when space heating is required (but is not available from the collector) and the storage temperature exceeds the building ambient temperature by 5°F. This mode terminates when the building ambient temperature equals the storage temperature or when space heating is no longer required.

Mode 3 - Collector-to-Space Heating: This mode activates when space heating is required and the collector supply-duct air temperature is 10°F higher than the building ambient air temperature. This mode terminates when the temperature difference drops to less than 6°F or the space heating requirement is satisfied.

Mode 4 - Auxiliary Energy-to-Space Heating: This mode activates when space heating is required and thermal energy is not available from the collectors or storage. An electrical heating element in the hot air supply-duct remains on until the space heating demand is satisfied.

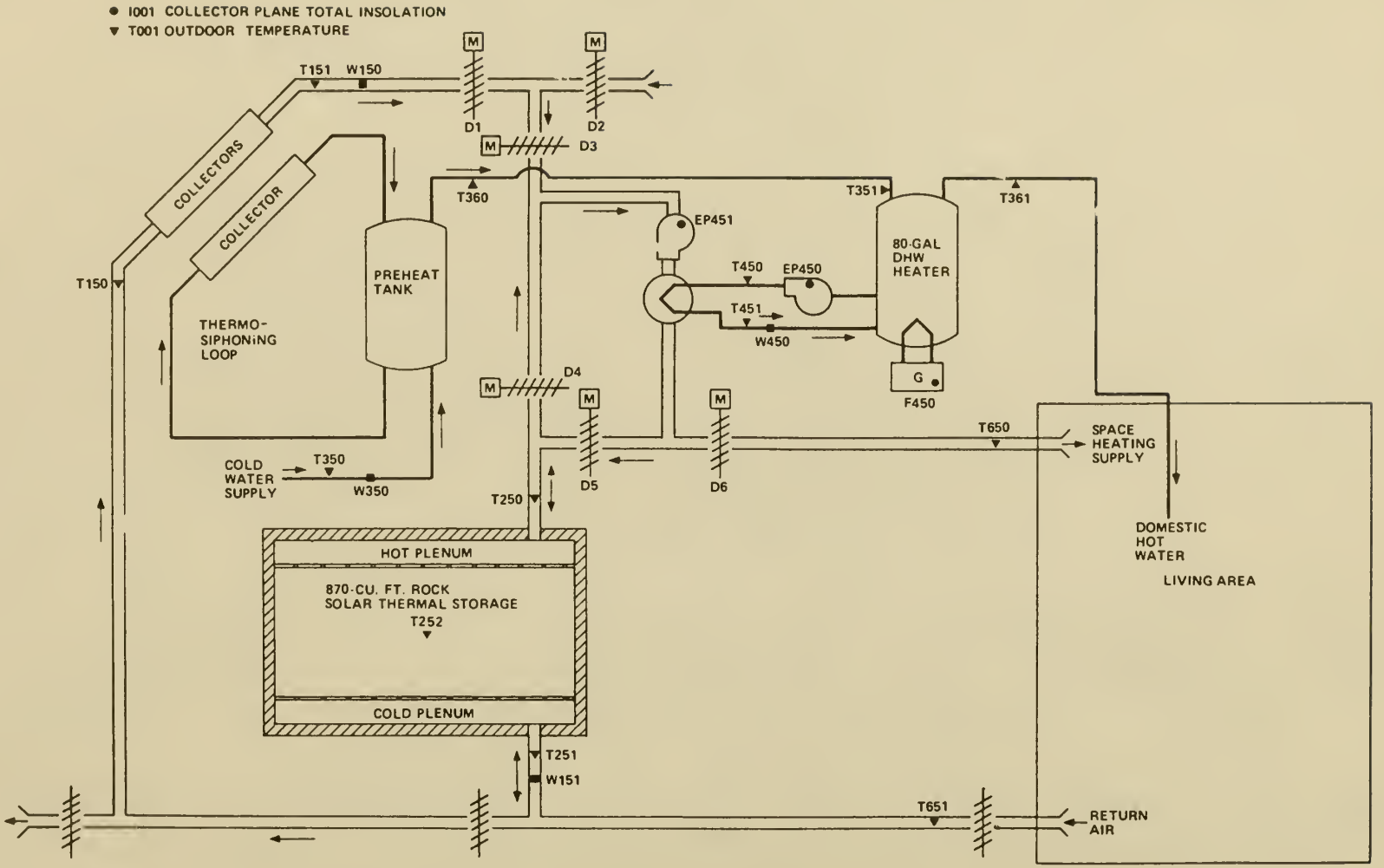

Figure 1. HELIO THERMICS, INC., LOT NO. 6, SOLAR ENERGY SYSTEM SCHEMATIC

Mode 5 - Summer Mode, Passive Cooling Storage: This mode can be activated when the residents wish to store cool air in storage for circulation the next day. The air-handler fan activates and an outside air-intake damper opens to allow the cool air to circulate through the attic and storage.

Mode 6 - Summer Mode, Space Cooling: This mode can be activated when cool air from storage is desired in the living area. The outside air-intake damper closes, the duct to the living area opens, and the air-handler fan activates.

Mode 7 - DHW Preheating: This mode activates when there is a demand for hot water. Water is drawn from the conventional DHW tank and replenished with heated water from the preheat tank. The DHW subsystem has this one independent mode of operation for preheating.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in January and the solar energy system operated continuously during the month. The solar energy system provided a fossil fuel energy savings of 1.7 million Btu.

Several one-time anomalies which occurred in the beginning of January were corrected during a Boeing engineering site visit on January 9 and 10. The data for January 11 through January 31 was used and then extrapolated to reflect a full month's data. The space heating load and the auxiliary fossil fuel energy for the DHW and space heating subsystems could not be determined because of an unreliable gas totalizer. There was no solar energy contribution to the DHW subsystem in January because the hot water thermosiphoning system had been drained.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 16.8 million Btu for a daily average of 1305 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during January of 1784 Btu per square foot for a south-facing plane with a tilt of 51 degrees to the horizontal. The average ambient temperature during January was 37°F as compared with the long-term average for January of 42°F. The number of heating degree-days for the month (based on a 65°F reference) was 868, as compared with the long-term average of 704.

THERMAL PERFORMANCE

Collector - The total incident solar radiation on the collector array for the month of January was 16.8 million Btu. During the period the collector loop

was operating, the total insolation amounted to 12.7 million Btu. The total collected solar energy for the month of January was 3.6 million Btu, resulting in a collector array efficiency of 21 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 2.8 million Btu. Operating energy required by the collector loop was 0.24 million Btu.

Storage - Solar energy delivered to storage was 2.8 million Btu. There were 0.55 million Btu delivered from storage to the space heating subsystem. Energy loss from storage was 2.2 million Btu. This loss represented 79 percent of the energy delivered to storage. This "lost" energy is probably infiltrating the living space and thus reducing the auxiliary thermal requirements. This supposition cannot be arithmetically substantiated for January because the calculated actual space heating load is not available. The average storage temperature for the month was 64°F.

DHW Load - The DHW load was 2.3 million Btu. Since there was no solar energy contribution the load was satisfied by auxiliary fossil fuel energy (although it could not be calculated because of the gas totalizer problem). The thermosiphoning subsystem in the attic has been drained until warm weather. A daily average of 81 gallons of DHW was consumed at an average temperature of 148°F delivered from the tank.

Space Heating Load - The space heating subsystem total load could not be calculated because the gas totalizer, which measures the gas consumption, was not providing reliable data during January. A total of 1.0 million Btu of solar energy was consumed as space heat, 0.55 million Btu delivered from storage and the balance direct from the collector. The space heating subsystem consumed a total of 0.65 million Btu of operating energy which is not considered to be a solar energy system expense.

OBSERVATIONS

The site visit by Boeing and IBM engineers on January 10 and 11 resulted in the correction of several problems. In addition, a gas totalizer was installed to provide a more positive indication of gas consumption. There is still a problem with the instrumentation of this totalizer and also with the instrumentation of a water flowmeter in the auxiliary space heating subsystem. This prevents the computation of the space heating load and also the auxiliary fossil fuel energy contriubtion in the DHW and space heating subsystems. The hot water thermosiphoning subsystem has been drained until all danger of freezing has past.

ENERGY SAVINGS

The solar energy system provided a total fossil fuel energy savings of 1.7 million Btu; this savings was provided entirely by the space heating subsystem.

III. ACTION STATUS

A site visit by IBM and Boeing is scheduled for early February. The remaining instrumentation anomalies will be investigated at that time.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

SITE/SYSTEM DESCRIPTION:
THE HELIOTHERMICS SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER PREHEATING. IN THE SPACE HEATING SUBSYSTEM, THERMAL ENERGY IS TRANSFERRED BY AIR CIRCULATION FROM THE ATTIC TO THE LOAD OR TO CRUSHED ROCK IN AN INSULATED CONCRETE BIN. IN THE DOMESTIC HOT WATER SUBSYSTEM, SOLAR ENERGY IS COLLECTED FROM A 70 SQ. FT ALUMINUM AND COPPER PADDLE IN THE ATTIC AND TRANSFERRED TO AN 80 GAL. PREHEAT TANK BY THERMOSIPHONING. AUXILIARY ENERGY IS PROVIDED TO BOTH SUBSYSTEMS BY A COMMON NATURAL GAS WATER HEATER.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	16.823	MILLION BTU
	40441	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	3.594	MILLION BTU
	8640	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	37	DEGREES F
AVERAGE BUILDING TEMPERATURE	68	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.06	
ECSS OPERATING ENERGY	0.236	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.883	MILLION BTU
TOTAL ENERGY CONSUMED	4.478	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	2.261	*	N.A.	*	MILLION BTU
SOLAR FRACTION	*	*	N.A.	*	PERCENT
SOLAR ENERGY USED	0.000	1.003	N.A.	1.003	MILLION BTU
OPERATING ENERGY	N.A.	0.647	N.A.	0.883	MILLION BTU
AUX. THERMAL ENERGY	*	*	N.A.	*	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
AUX. FOSSIL FUEL	*	*	N.A.	0.000	MILLION BTU
ELECTRICAL SAVINGS	N.A.	*	N.A.	*	MILLION BTU
FOSSIL SAVINGS	0.000	1.672	N.A.	1.672	MILLION BTU

SYSTEM PERFORMANCE FACTOR: *

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

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GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	17.749 GIGA JOULES
	459247 KJ/SQ.M.
COLLECTED SOLAR ENERGY	3.792 GIGA JOULES
	98115 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	3 DEGREES C
AVERAGE BUILDING TEMPERATURE	20 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.06
ECSS OPERATING ENERGY	0.249 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.932 GIGA JOULES
TOTAL ENERGY CONSUMED	4.725 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	2.385	*	N.A.	* GIGA JOULES
SOLAR FRACTION	*	*	N.A.	* PERCENT
SOLAR ENERGY USED	0.000	1.058	N.A.	1.058 GIGA JOULES
OPERATING ENERGY	N.A.	0.682	N.A.	0.932 GIGA JOULES
AUX. THERMAL ENG	*	*	N.A.	* GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
AUX. FOSSIL FUEL	*	*	N.A.	0.000 GIGA JOULES
ELECTRICAL SAVINGS	N.A.	*	N.A.	* GIGA JOULES
FOSSIL SAVINGS	0.000	1.764	N.A.	1.764 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: *

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	*	*	*	N	*	N	*
2	*	*	*	O	*	O	*
3	*	*	*	T	*	T	*
4	*	*	*		*		*
5	*	*	*	A	*	A	*
6	*	*	*	P	*	P	*
7	*	*	*	P	*	P	*
8	*	*	*	L	*	L	*
9	*	*	*	I	*	I	*
10	*	*	*	C	*	C	*
11	0.548	36	0.050	A	0.007	A	0.092
12	0.028	34	0.020	B	0.000	B	0.717
13	0.043	40	0.000	L	0.000	L	0.002
14	0.693	39	0.032	E	0.010	E	0.046
15	0.795	27	0.053		0.011		0.067
16	0.755	36	0.057		0.011		0.076
17	0.643	51	0.018		0.011		0.028
18	0.692	49	0.017		0.013		0.024
19	0.092	33	0.074		0.000		0.803
20	0.009	33	0.003		0.000		0.298
21	0.265	39	0.000		0.001		0.000
22	0.749	33	0.022		0.011		0.029
23	0.658	36	0.023		0.011		0.035
24	0.418	35	0.019		0.003		0.045
25	0.804	32	0.026		0.012		0.033
26	0.733	35	0.024		0.013		0.032
27	0.108	37	0.041		0.000		0.383
28	0.850	36	0.030		0.011		0.035
29	0.831	31	0.062		0.011		0.075
30	0.820	36	0.048		0.011		0.058
31	0.862	39	0.061		0.013		0.070
SUM	16.823	-	1.003	N.A.	0.236	N.A.	-
AVG	0.543	37	0.032	N.A.	0.008	N.A.	0.060
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	*	*	*	*	*
2	*	*	*	*	*
3	*	*	*	*	*
4	*	*	*	*	*
5	*	*	*	*	*
6	*	*	*	*	*
7	*	*	*	*	*
8	*	*	*	*	*
9	*	*	*	*	*
10	*	*	*	*	*
11	0.548	0.349	0.085	46	0.154
12	0.028	0.000	-0.000	33	-0.015
13	0.043	0.000	0.000	42	0.000
14	0.693	0.547	0.122	46	0.176
15	0.795	0.649	0.170	39	0.214
16	0.755	0.607	0.176	49	0.233
17	0.643	0.551	0.167	60	0.259
18	0.692	0.588	0.200	59	0.289
19	0.092	0.001	0.000	35	0.002
20	0.009	0.000	-0.001	33	-0.095
21	0.265	0.017	0.002	42	0.007
22	0.749	0.497	0.125	41	0.167
23	0.658	0.580	0.176	43	0.267
24	0.418	0.192	0.013	36	0.031
25	0.804	0.614	0.171	41	0.212
26	0.733	0.624	0.241	50	0.330
27	0.108	0.000	-0.001	42	-0.005
28	0.850	0.717	0.160	46	0.189
29	0.831	0.681	0.203	44	0.244
30	0.820	0.672	0.238	50	0.290
31	0.862	0.745	0.188	48	0.218
SUM	16.823	12.740	3.594	-	-
AVG	0.543	0.411	0.116	44	0.214
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	*	*	*	*	*
2	*	*	*	*	*
3	*	*	*	*	*
4	*	*	*	*	*
5	*	*	*	*	*
6	*	*	*	*	*
7	*	*	*	*	*
8	*	*	*	*	*
9	*	*	*	*	*
10	*	*	*	*	*
11	0.066	0.036	-0.008	65	0.425
12	0.000	0.016	-0.027	64	-79.404
13	0.000	-0.017	-0.002	63	1.000
14	0.095	0.011	0.015	64	0.268
15	0.127	0.039	0.010	64	0.390
16	0.126	0.036	0.004	65	0.317
17	0.136	0.013	0.052	66	0.481
18	0.156	0.015	0.097	71	0.716
19	0.000	0.074	-0.155	67	-395.749
20	0.000	-0.007	-0.025	64	-570.124
21	-0.000	-0.040	-0.021	63	187.654
22	0.106	-0.001	0.015	62	0.126
23	0.129	0.014	0.017	63	0.238
24	0.007	-0.002	-0.023	63	-3.441
25	0.131	0.009	0.021	63	0.226
26	0.189	0.021	0.065	65	0.457
27	0.000	0.027	-0.082	63	-176.972
28	0.115	0.008	0.023	64	0.269
29	0.148	0.034	0.010	64	0.301
30	0.169	0.029	0.031	64	0.357
31	0.165	0.057	-0.008	66	0.295
SUM	2.755	0.549	0.012	-	-
AVG	0.089	0.018	0.000	64	0.204
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC — SOLAR/1025-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	*	*	*	N	*	N	*	N	*	*	*	*
2	*	*	*	O	*	O	*	O	*	*	*	*
3	*	*	*	T	*	T	*	T	*	*	*	*
4	*	*	*		*		*		*	*	*	*
5	*	*	*	A	*	A	*	A	*	*	*	*
6	*	*	*	P	*	P	*	P	*	*	*	*
7	*	*	*	P	*	P	*	P	*	*	*	*
8	*	*	*	L	*	L	*	L	*	*	*	*
9	*	*	*	I	*	I	*	I	*	*	*	*
10	*	*	*	C	*	C	*	C	*	*	*	*
11	0.125	*	0.000	A	*	A	*	A	0.000	49	148	138
12	0.014	*	0.000	B	*	B	*	B	0.000	39	148	14
13	0.004	*	0.000	L	*	L	*	L	0.000	42	155	4
14	0.052	*	0.000	E	*	E	*	E	0.000	46	150	60
15	0.036	*	0.000		*		*		0.000	41	146	38
16	0.087	*	0.000		*		*		0.000	41	149	89
17	0.121	*	0.000		*		*		0.000	52	153	149
18	0.025	*	0.000		*		*		0.000	53	145	32
19	0.107	*	0.000		*		*		0.000	44	152	112
20	0.114	*	0.000		*		*		0.000	40	151	119
21	0.036	*	0.000		*		*		0.000	44	152	40
22	0.040	*	0.000		*		*		0.000	43	151	44
23	0.170	*	0.000		*		*		0.000	44	147	185
24	0.056	*	0.000		*		*		0.000	43	152	61
25	0.091	*	0.000		*		*		0.000	42	157	101
26	0.014	*	0.000		*		*		0.000	41	140	16
27	0.127	*	0.000		*		*		0.000	44	144	141
28	0.017	*	0.000		*		*		0.000	45	146	20
29	0.142	*	0.000		*		*		0.000	41	149	146
30	0.055	*	0.000		*		*		0.000	44	146	63
31	0.102	*	0.000		*		*		0.000	47	147	120
SUM	2.261	-	0.000	N.A.	*	N.A.	*	N.A.	0.000	-	-	2497
AVG	0.073	*	0.000	N.A.	*	N.A.	*	N.A.	0.000	44	149	81
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC
REPORT PERIOD: JANUARY,1979

SOLAR/1025-79/01

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	B_DG TEMP DEG. F	AMB TEMP DEG. F
1	*	*	*	*	*	NOT APPLICABLE	*	*	*	*	*
2	*	*	*	*	*		*	*	*	*	*
3	*	*	*	*	*		*	*	*	*	*
4	*	*	*	*	*		*	*	*	*	*
5	*	*	*	*	*		*	*	*	*	*
6	*	*	*	*	*		*	*	*	*	*
7	*	*	*	*	*		*	*	*	*	*
8	*	*	*	*	*		*	*	*	*	*
9	*	*	*	*	*		*	*	*	*	*
10	*	*	*	*	*		*	*	*	*	*
11	*	*	0.050	0.027	*		*	*	0.084	68	36
12	*	*	0.020	0.039	*		*	*	0.034	55	34
13	*	*	0.000	0.006	*		*	*	0.000	67	40
14	*	*	0.032	0.013	*		*	*	0.054	67	39
15	*	*	0.053	0.030	*		*	*	0.089	67	27
16	*	*	0.057	0.027	*		*	*	0.095	68	36
17	*	*	0.018	0.019	*		*	*	0.030	71	51
18	*	*	0.017	0.006	*		*	*	0.028	70	49
19	*	*	0.074	0.045	*		*	*	0.123	67	33
20	*	*	0.003	0.024	*		*	*	0.004	67	33
21	*	*	0.000	0.004	*		*	*	0.000	68	39
22	*	*	0.022	0.012	*		*	*	0.036	67	33
23	*	*	0.023	0.023	*		*	*	0.039	68	36
24	*	*	0.019	0.021	*		*	*	0.032	69	35
25	*	*	0.026	0.010	*		*	*	0.044	68	32
26	*	*	0.024	0.021	*		*	*	0.040	67	35
27	*	*	0.041	0.022	*		*	*	0.069	68	37
28	*	*	0.030	0.010	*		*	*	0.049	68	36
29	*	*	0.062	0.030	*		*	*	0.104	68	31
30	*	*	0.048	0.026	*		*	*	0.080	68	36
31	*	*	0.061	0.023	*		*	*	0.101	69	39
SUM	*	-	1.003	0.647	*	N.A.	*	*	1.672	-	-
AVG	*	*	0.032	0.021	*	N.A.	*	*	0.054	68	37
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SD_AR/1025-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	*	N	*	*	N	N	N
2	*	O	*	*	O	O	O
3	*	T	*	*	T	T	T
4	*		*	*			
5	*	A	*	*	A	A	A
6	*	P	*	*	P	P	P
7	*	P	*	*	P	P	P
8	*	L	*	*	L	L	L
9	*	I	*	*	I	I	I
10	*	C	*	*	C	C	C
11	1317	A	36	46	A	A	A
12	68	B	34	33	B	B	B
13	104	L	40	42	L	L	L
14	1666	E	39	46	E	E	E
15	1911		27	39			
16	1816		36	49			
17	1546		51	60			
18	1553		49	59			
19	221		33	35			
20	21		33	33			
21	638		39	42			
22	1800		33	41			
23	1531		36	43			
24	1006		35	36			
25	1933		32	41			
26	1761		35	50			
27	258		37	42			
28	2044		36	46			
29	1998		31	44			
30	1972		36	50			
31	2072		39	48			
SUM	40441	N.A.	-	-	-	-	-
AVG	1305	N.A.	37	44	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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